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A Brief History of Life on Earth

The diversity of species, ecosystems and landscapes that surround us today are the product of perhaps 3.7 billion (i.e., 3.7×10^9) to 3.85 billion years of evolution of life on Earth (Mojzsis et al., 1996; Fedo and Whitehouse, 2002). Life may have first evolved under harsh conditions, perhaps comparable to the deep-sea thermal vents where chemo-autotrophic bacteria are currently found (these are organisms that obtain their energy only from inorganic, chemical sources).

A subterranean evolution of life has also been suggested. Rock layers deep below the continents and ocean floors, that were previously thought to be too poor in nutrients to sustain life, have now been found to support thousands of strains of microorganisms. Types of bacteria have been collected from rock samples almost 2 miles below the surface, at temperatures up to 75 degrees Celsius. These chemo-autotrophic microorganisms derive their nutrients from chemicals such as carbon, hydrogen, iron and sulphur. Deep subterranean communities could have evolved underground or originated on the surface and become buried or otherwise transported down into subsurface rock strata, where they have subsequently evolved in isolation. Either way, these appear to be very old communities, and it is possible that these subterranean bacteria may have been responsible for shaping many geological processes during the history of the Earth (e.g., the conversion of minerals from one form to another, and the erosion of rocks) (Fredrickson and Onstott, 1996).

The earliest evidence for photosynthetic bacteria - suspected to be cyanobacteria - is dated at sometime between 3.5 and 2.75 billion years ago (Schopf, 1993; Brasier et al., 2002; Hayes, 2002). These first photosynthetic organisms would have been responsible for releasing oxygen into the atmosphere. (**Photosynthesis** is the formation of carbohydrates from carbon dioxide and water, through the action of light energy on a light-sensitive pigment, such as chlorophyll, and usually resulting in the production of oxygen). Prior to this, the atmosphere was mainly composed of carbon dioxide, with other gases such as nitrogen, carbon monoxide, methane, hydrogen and sulphur gases present in smaller quantities.

It probably took over 2 billion years, from the initial advent of photosynthesis for the oxygen concentration in the atmosphere to reach the level it is at today (Hayes, 2002). As oxygen levels rose, some of the early anaerobic species probably became extinct, and others probably became restricted to habitats that remained free of oxygen. Some assumed a lifestyle permanently lodged inside aerobic cells. The anaerobic cells might, initially, have been incorporated into the aerobic cells after those aerobes had engulfed them as food. Alternatively, the anaerobes might have invaded the aerobic hosts and become parasites within them. Either way, a more intimate symbiotic relationship subsequently evolved between these aerobic and anaerobic cells. In these cases the survival of each cell was dependent on the function of the other cell.

The evolution of this symbiotic relationship was an extremely important step in the evolution of more complex cells that have a nucleus, which is a characteristic of the Eucarya or eucaryotes (eu = good, or true; and karyon = kernel, or nucleus). Recent studies of rocks from Western Australia have suggested that the earliest forms of single-celled eucaryotes might be at least 2.7 billion years old (Anon, 2001). According to contemporary theories, there has been sufficient time, over those 2.7 billion years, for some of the genes of the invading anaerobe to have been lost, or even transferred to the nucleus of the host aerobe cell. As a result, the genomes of the ancestral invader and ancestral host have become mingled and the two entities can now be considered as one from a genetic standpoint.

The evolutionary history of the Eucarya is described in various standard references and so is not covered in detail here. Briefly, eucaryotes constitute three well known groups - the Viridiplantae or green plants, the Fungi, and the Metazoa or animals. There are also many basal groups of eucaryotes that are extremely diverse - and many of which are evolutionarily ancient. For example, the Rhodophyta, or red algae, which might be the sister-group to the Viridiplantae, includes fossil representatives dating from the Precambrian, 1025 billion years ago. The Stramenopiles includes small, single-celled organisms such as diatoms, fungus-like species of water moulds and downy mildews, and extremely large, multicellular brown seaweeds such as kelps.

The earliest known green plants are green algae, dating from the Cambrian, at least 500 million years ago. By the end of the Devonian, 360 million years ago, plants had become quite diverse and included representatives similar to modern plants. Green plants have been extremely important in shaping the environment. Fueled by sunlight, they are the primary producers of carbohydrates, sugars that are essential food resources for herbivores that are then prey to predatory carnivores. The evolution and ecology of pollinating insects is closely associated with the evolution of the Angiosperms, or flowering plants, since the Jurassic and Cretaceous periods.

Fungi, which date back to the Precambrian times about 650 to 540 million years ago, are also important in shaping and sustaining biodiversity. By breaking down dead organic material and using this for their growth, they recycle nutrients back through ecosystems. Fungi are also responsible for causing several plant and animal diseases. Fungi also form symbiotic relationships with tree species, often in nutrient-poor soils such as are found in the humid tropics, allowing their symbiont trees the ability to flourish in what would otherwise be a difficult environment.

Metazoa, which date to over 500 million years ago have also been responsible for shaping many ecosystems, from the specialized tubeworms of deep sea, hydrothermal vent communities of the ocean floor, to the birds living in the high altitudes of the Himalayas, such as the impeyan pheasant and Tibetan snow cock. Many species of animals are parasitic on other species and can significantly affect the behavior and life-cycles of their hosts.

Thus, the evolutionary history of Earth has physically and biologically shaped our contemporary environment. Many existing landscapes are based on the remains of earlier life forms. For example, some existing large rock formations are the remains of ancient reefs formed 360 to 440 million years ago by communities of algae and invertebrates (Veron, 2000).

Glossary

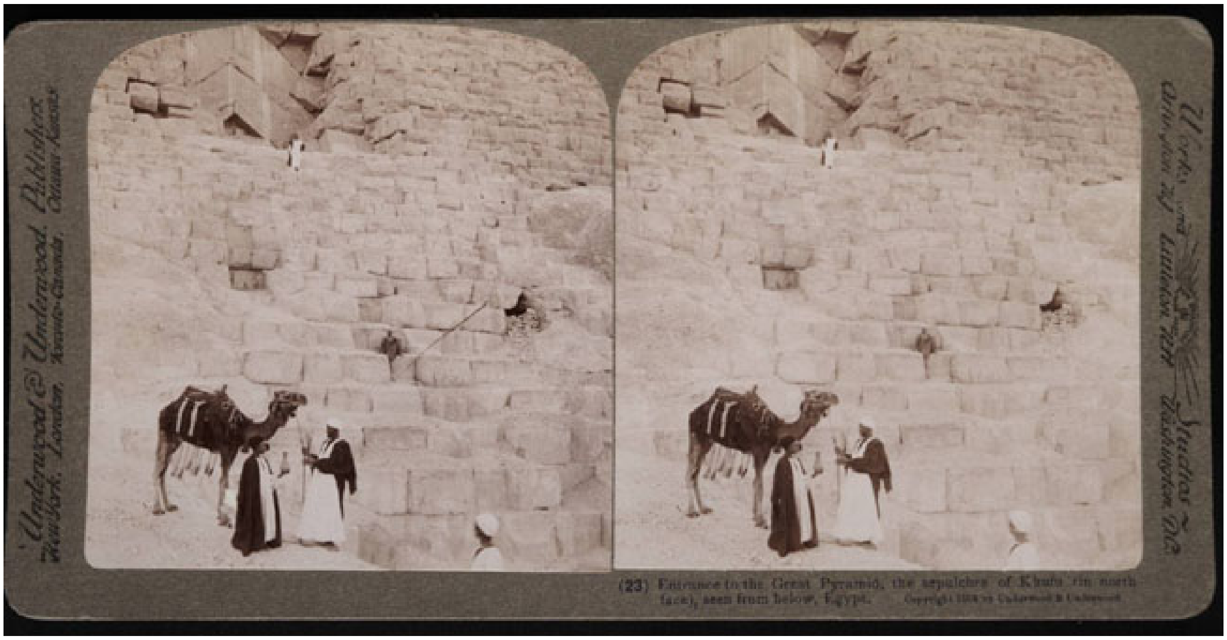
Photosynthesis

the formation of carbohydrates from carbon dioxide and water, through the action of light energy on a light-sensitive pigment, such as chlorophyll, and usually resulting in the production of oxygen

Egypt through the Stereoscope: Stereography and Virtual Travel

Stereography and Travel

According to stereography’s advocates, stereographs allowed people to “tour” foreign lands without the expense and hassle of actually going there. Moreover, virtual tourists could look at the sites as often and as long as they liked, and three-dimensional imaging added to the sense of reality. As Oliver Wendell Holmes wrote, “the sights which men risk their lives and spend their money and endure sea-sickness to behold,--the view of Nature and Art which makes exiles of entire families for the sake of a look at them, and render ‘bronchitis’ and dyspepsia, followed by leave of absence, endurable dispensations to so many worthy shepherds,--these sights, gathered from Alps, temples, palaces, pyramids, are offered you for a trifle, to carry home with you, that you many look at them at your leisure, by your fireside, with perpetual fair weather, when you are in the mood, without catching cold, without following a valet-de-place, in any order of succession,--from a glacier to Vesuvius, from Niagra to Memphis,--as long as you like, and breaking off as suddenly as you like” (38-39). Not only does stereography make “travel” more comfortable and convenient, but, Holmes implies, it also allows the viewer in a sense to “own” the scene, to place it into a viewer and stand gazing over it (Fowles 91). Note that Holmes uses Egyptian sites such as the pyramids and Memphis as examples of important places for travelers to experience, revealing the significance of Egypt as a place for virtual travel.


Underwood & Underwood, Publishers.
(23) Entrance to the Great Pyramid, the sepulchre of Khufu (in north face), seen from below, Egypt.

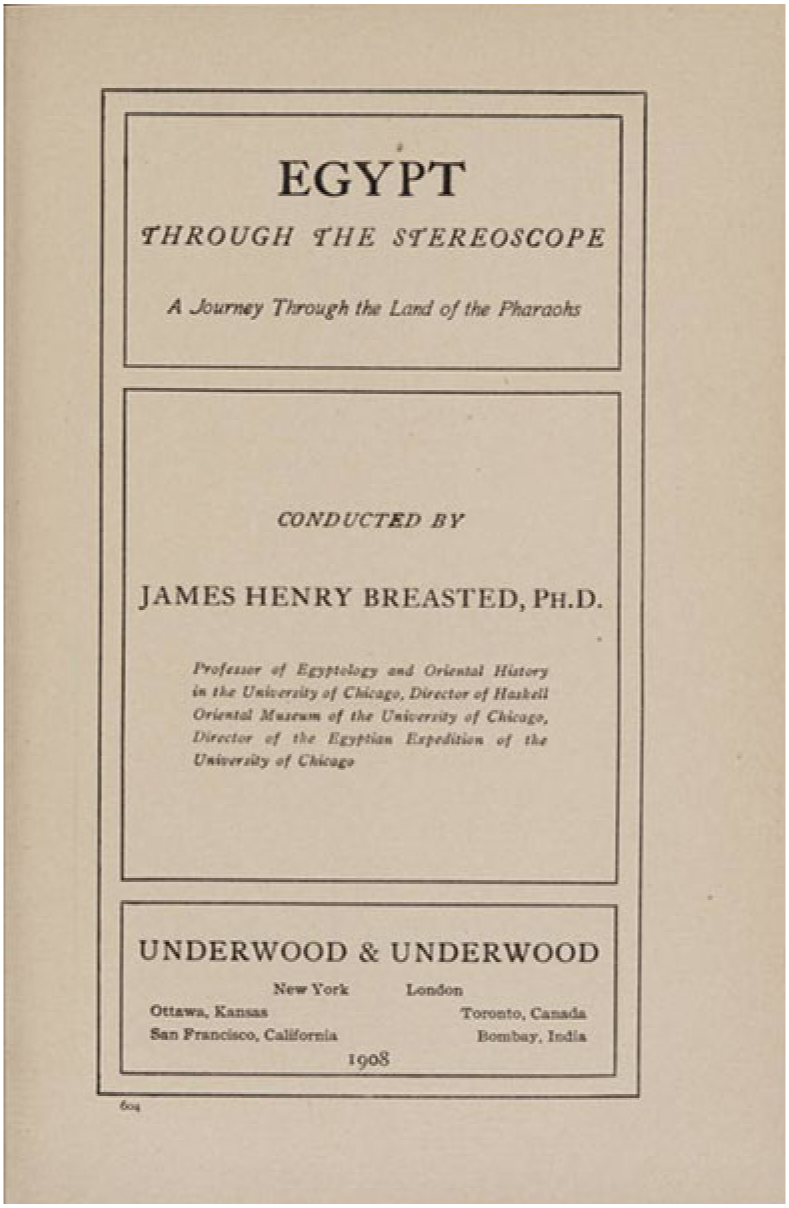
“The entrance to the Great Pyramid, the sepulcher of Khufu (in north face), seen from below.” Stereograph. Breasted, James Henry. *Egypt through the Stereoscope* (NY: Underwood and Underwood, 1905, 1908). From TIMEA. (August 19, 2006). http://dspace.rice.edu/handle/1911/5593

By making images of foreign cultures available cheaply and with seeming realism, stereographs enabled mass “virtual” tourism. Stereographs could serve as mementoes of travel, or substitutes for it. Among the most popular locations for armchair travelers to venture via stereography were the Holy Land and Egypt, since these places had special religious significance and featured important archaeological sites, some recently excavated. As William Darrah notes, “A steady stream of stereo views depicting the classic antiquities of Rome, Naples, Athens, Egypt and the Holy Land, together with those of the cathedrals, public buildings and palaces of the tourist centers of Europe provided mementos of the journey and vicarious adventure for those who had to remain at home” (17). Companies organized stereograph collections into “tours,” capturing the major sites and simulating travel to them. Stereographs helped to define the public’s understanding of foreign countries and expectations of what travel there would be like. As Steven Hoelscher argues, “Acquiring photographs gives shape to travel as it informs what the viewer should see, how it should be seen, and when it should be seen--all in a matter-of-fact and seemingly "unmediated" way” (549). Just as guidebooks offered a mediated journey through foreign countries, so stereographs presented travel from carefully chosen perspectives. Sometimes working with “experts” on the countries represented, stereograph photographers and publishers determined what sites to photograph, what perspective to take, and how to frame the shot.

Around the same time that photography was being established as a leading form of art and communication, Egyptology, the study of Egyptian civilization, was becoming an important field of study. Egyptologists used photographs to document and study their findings, while photographers helped to feed the public interest in Egypt with their stunning views of the country’s monuments, artifacts, historic sites and daily life. In the late 1850s, photographer Francis Frith toured Egypt and produced **Stereoscopic Views of the Holy Land, Egypt and Nubia**. Reviewing Francis Frith’s exquisite stereographs, **The Times**of London raved, “You look through your stereoscope, and straightway you stand beside the fabled Nile, watching the crocodile asleep upon its sandy shore, with the superb ruins of Philae in the distance. The scene changes, and you are in the Desert…. **”**(qtd. by Evans). Beginning in the 1870s, photographers based in Egypt such as G. Lekegian and J. Heyman & Co. produced stereographs, selling particularly to tourists. US publisher Underwood and Underwood made a boxed set of stereographs focusing on Egypt that William Darrah calls “the best stereo representation of the region ever published” (132).

James Henry Breasted’s Egypt through the Stereoscope

Egyptologist Dr. James Henry Breasted (1865-1935) was likewise impressed by the Underwood stereographs of Egypt: “Having seen the Oriental photographs of Mesrs. Underwood & Underwood, I am very glad to testify to their unusual beauty and value, and to assure the publishers that their collection offers to the purchaser a very vivid and adequate picture of the countries and peoples illustrated” (qtd. by Evans). Since Breasted was recognized as a leading expert on Egypt, Underwood sought his endorsement and invited him to write a guidebook to accompany a boxed set of Egyptian stereoviews. Breasted came to the study of Egypt through his interest in religion. Skeptical about the historical accuracy of the Bible, Breasted went to Yale University to study Hebrew with William Rainey Harper. When Harper became president of the University of Chicago, he recruited Breasted to teach Egyptology in the university’s department of biblical studies and sent him to study at the University of Berlin with noted Egyptologist Adolf Erman. Breasted received his Ph.D. from the University of Berlin in 1894, writing his dissertation on Pharaoh Akhnaten's hymns to the sun god. He and his new wife Francis Hart toured Egypt for their honeymoon in 1894, taking a two-month cruise along the Nile and stopping at historic sites along the way. Breasted returned to the US and became a faculty member at the University of Chicago and assistant director of its Haskell Oriental Museum. Breasted gave lectures about Egyptian history and culture throughout the US, which honed his ability to communicate with a non-academic audience. He built a reputation as the United States’ leading Egyptologist with the publication of two works: Ancient Records of Egypt (1906-1907), a five-volume translation of historical inscriptions until 525 B.C., when the Persians first conquered Egypt; and A History of Egypt (1905), a chronological survey from prehistory to 525 B.C. He also published a popular textbook, Ancient Times: A History of the Early World (1916). Breasted made an important contribution to the field of ancient Near Eastern studies by establishing the University of Chicago’s Oriental Institute, which became a leading research center (Van De Mieroop).



EGYPT
THROUGH THE STEREOSCOPE

A Journey Through the Land of the Pharaohs

CONDUCTED BY

JAMES HENRY BREASTED, PH.D.

Professor of Egyptology and Oriental History in the University of Chicago, Director of Haskell Oriental Museum of the University of Chicago, Director of the Egyptian Expedition of the University of Chicago

UNDERWOOD & UNDERWOOD
New York London
Ottawa, Kansas Toronto, Canada
San Francisco, California Bombay, India
1908

604

Title page to James Henry Breasted's *Egypt through the Stereoscope* (NY: Underwood and Underwood, 1905, 1908). From TIMEA. (August 19, 2006). http://dspace.rice.edu/handle/1911/9166

Breasted embraced the educational potential of stereographs, recommending "this system of stay-at-home travel" for accurately reproducing the monuments and historic sites of Egypt and conveying viewers to the past (11). Even if people could not afford to travel to Egypt, Breasted said, they could enjoy "a vivid prospect" on 100 carefully selected sites, learn about Egypt, and become a "citizen of the world" (12, 13). As Evans notes, "He envisioned its benefits and great importance to stimulating interest in Egyptology and attracting young recruits. Underwood and Underwood also knew the attraction Egypt had, even more so in the Victorian age of Egyptomania." Thus in 1901 Breasted agreed to write a guidebook for Underwood that would accompany a set of 100 stereoviews. Underwood asked Breasted to "…put what he has to say in the first person much as he would talk as if he could stand with a person in the presence of the actual places" (letter from Underwood and Underwood, July 31, 1901; qtd. by Evans). From the stereographs created by photographer Charles H. Baker, Breasted selected the 100 views that were included in Egypt through the Stereoscope and wrote the accompanying text, completing the 360 page book in 1905. In the introduction to *Egypt through the Stereoscope*, Breasted touted the ability of the stereoscope to make a distant place seem real and allow close study: "In the preparation of the following pages, I have constantly had my eyes within the hood of the stereoscope, and I cannot forbear to express here the growing surprise and delight, with which I observed as the work proceeded, that it became more and more easy to speak of the prospect revealed in the instrument, as one actually spread out before me. The surprising depth and atmosphere with which the scientifically constructed instrument interpreted what were actually but bits of paper and pasteboard, were a revelation; indeed, I constantly sat by an open window looking out over the actual ruins of the Nile Valley, which I could study, one after another, at will" (13). Breasted embraced the technology of stereoscopy, marveling at the way that carefully constructed devices could simulate distant monuments. As Evans notes, "Breasted was intensely interested in new methods and new techniques in recovering early chapters of man's history, but chiefly in promoting a new attitude to and a new interpretation of the past." In 1908, a second edition of Egypt through the Stereoscope and the accompanying stereocards were issued. Egypt through the Stereoscope and most of the accompanying stereographs are available through the TIMEA project.

References

Darrah, William. *The World of Stereographs*. Gettysburg, PA: Darrah, 1977.

Evans, Elaine A. “In The Sandals of Pharaoh: James Henry Breasted and the Stereoscope.” McClung Museum. 9 August 2006. http://mcclungmuseum.utk.edu/newresearch/stereoscope/stereoscope.htm

Fowles, Jib. “Stereography and the standardization of vision.” *Journal of American Culture*. 17.2 (1994): 89-94.

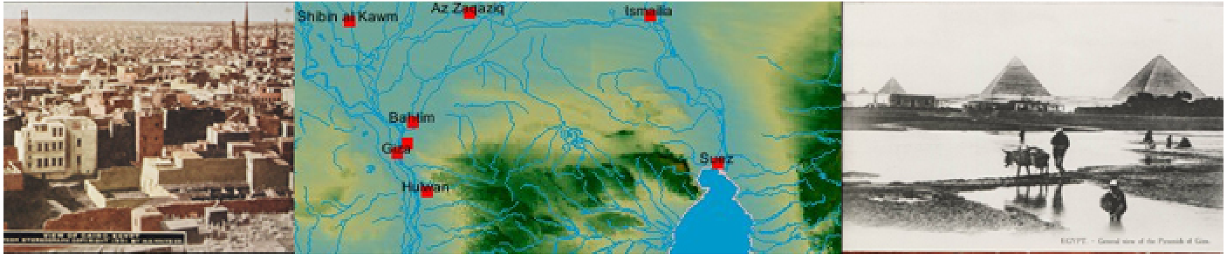
Hoelscher, Steven. “The Photographic Construction of Tourist Space in Victorian America.” *Geographical Review*. 88.4 (1998): 548-570. JSTOR.

Holmes, Oliver Wendell. *The Stereoscope and Stereoscopic Photographs*. New York and London: Underwood & Underwood, 1906.

Van De Mieroop, Marc "Breasted, James Henry,” *American National Biography Online* Feb. 2000. 13 August 2006. http://www.anb.org/articles/14/14-00069.html

Placing History: Introducing geographic information systems in the context of current humanities research

> *Between the eighteenth and twentieth centuries, many Europeans and Americans traveled to the Middle East for a number of reasons. Some came to conduct archaeological expeditions or tour religious sites, while others hoped to investigate ancient cultures or pursue geopolitical interests. These travelers documented their visits through narratives and images, and today these documents provide invaluable resources for students and scholars in a variety of disciplines, ranging from literature and women's studies, to archaeology, religion, history, and postcolonial studies. Until now, these materials have been scattered throughout libraries and private collections around the world, and systematic research on these documents has been time-consuming and expensive. However, TIMEA, the Travelers in the Middle East Archive, provides greater access to many of these rare materials as well as sophisticated analytical tools, thereby enabling new modes of scholarship focused on these textual, visual, and geographical resources.*
>
> *-from the* ***TIMEA*** *project web portal*



The TIMEA project is not only about digitally reproducing and disseminating rare printed materials from earlier centuries but also about producing new, technologically-advanced maps to place these materials in their original geographic contexts.(images courtesy of the TIMEA project)

TIMEA is a digital archive of narratives documenting travel to the Middle East published between the 18th and early 20th centuries, along with images and interactive GIS maps. Initiated in 2004, this project has quickly distinguished itself as an innovative digital archive but it has done so by tackling the same dilemmas that conflict virtually every other work of historical research: how to best make the research exciting, relevant and publicly accessible. Chief among TIMEA's strategies for addressing these issues has been an embracing of advanced mapping technology, namely geographic information systems or GIS, as both a deliberate means of organizing the research *through geography* and a means of making the public interface with the research more graphic and interactive. In practice, what this means is that TIMEA aims to use interactive GIS maps as a means of accessing a diverse range of other visual materials. To understand how GIS makes this possible, the first thing to know is that GIS is not simply the most recent development in the long history of cartography but also signifies a quiet revolution in the way maps are used and how map-making is actually conceived. In fact, a quick look at the the prehistory of GIS will help frame why GIS makes sense in the context of the TIMEA project and other current humanities-based research projects.

MAPS AS WE ONCE KNEW THEM

Maps, those that we familiarly imagine as hand-drawn, rolled-up, folded, marked by tattered edges and discolored from age, have been a hallmark of historical research for a very long time. They have, in essence, enabled researchers to place—or date— their findings at a particular juncture in time within a landscape that simply cannot resist the effects of time. In other words, maps allow us to stop time and in the process provide us with a clear snapshot of a specific geography that will inevitably be outdated, either already or sometime in the near future. The map shown below from 1885, or in fact any map that is dated, illustrates perhaps one of the few truly enduring conditions that cartography has had to face in its long development. This obvious reality-- that a map from one year will be quickly replaced by a map of the following year-- has lent substantial character to the specialized craft of map-making, but also signifies an enormous shortcoming of the craft. In fact, from this perspective, the idea of assembling a map collection becomes less a matter of cultural value and more a matter of cultural necessity.

An example of a hand-drawn historical map of the Nile delta region of Egypt from 1885, digitally reproduced courtesy of the TIMEA project. The information on the map represents the specific knowledge, culture and technology of the period in which it was made.

This laborious manner of manually making maps-- to be fair, it has been the only technique for much of history-- does seem remarkably consistent with the other aspects of a research process. A new map can be produced with each successive discovery, which in turn allows for a rich picture of how a research project has evolved. This is in fact exactly how many of the aged books in the TIMEA collection are pieced together. Presenting themselves as travelogues of academic travelers-- archeologists, anthropologists, historians of one kind or another--, each book collects a range of written and graphic material by the author to help illustrate a portrait of a place at a specific time. Exquisitely drawn maps are certainly a major part of this presentation, and they work very well in this context. Nonetheless, if we leap forward to the 21st century, research in the humanities looks very different—the TIMEA project is a case in point— as it leverages a variety of new interrelated imaging technologies including digital photography, digital video, interactive websites and, of course, geographic information systems. The exquisitely-drawn map, like photographic film and the manuscript, is soon deemed inadequate to convey the depth and complexity of the collected research and its functionality is soon reduced to being merely an artifact of an earlier era.

NEW TECHNOLOGIES, NEW MODES OF RESEARCH

New technologies give way to new ways of working, and the TIMEA project, despite its unique content, becomes one of many recent humanities-based research initiatives that aim to leverage these new modes of research. Take a quick look at a few notable examples beyond the TIMEA project:

Chaco Digital Initiative

The Valley of the Shadow

Lewis and Clark Across Missouri

Salem Witch Trials

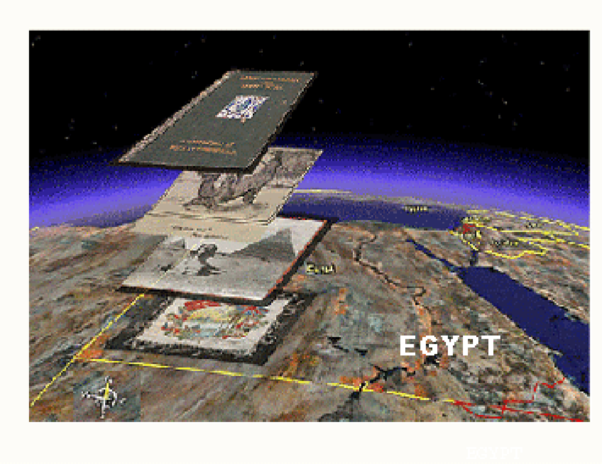
What these projects share with TIMEA is subject matter that is best represented through diverse artifacts from a wide variety of mediums. Equally significant, each initiative seeks to use some means of digital technology — interactive websites, online databases, online photo galleries, and interactive maps— to both organize these scattered materials and allow the public to discover their own relationships between artifacts. Try to imagine how one might have presented these varied artifacts before the digital age and it quickly becomes evident that current research methods are not simply incorporating new technologies but are being radically changed by them.

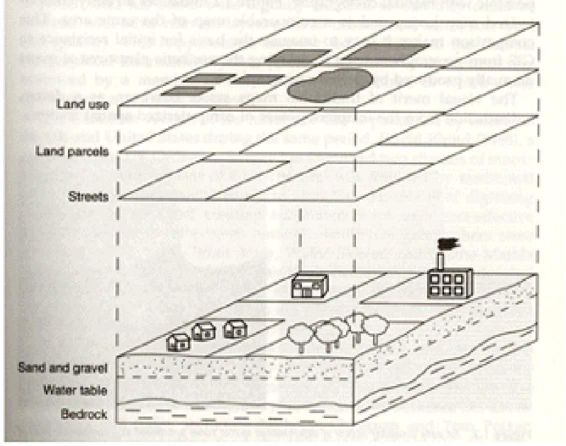
In the case of TIMEA, artifacts are not limited to books and photographs, but include a range of visual ephemera from scarves to cartoons to postcards. All of these items, however, are tied to the same Middle Eastern geography, providing clues to a changing landscape. The selection of items below, for example, are all dated from different years but all relate to Egypt, and obviously serve to describe the place from a dizzying array of perspectives. When working with this kind of complex array of materials, the geography, it seems, becomes the most logical way of organizing the research. And with the contemporary mode of map-making we've been calling geographic information systems, we now have a way of making maps that is actually consistent with a research method that attempts to gather and connect a complex set of artifacts into a textured interface for public consumption.

TIMEA brings together an enormous variety of printed antiquities, but reproduces them in digital formats for public dissemination. Discovering the relationships between these objects is at the heart of the project. (all images are courtesy of the TIMEA project)

INTRODUCING GIS

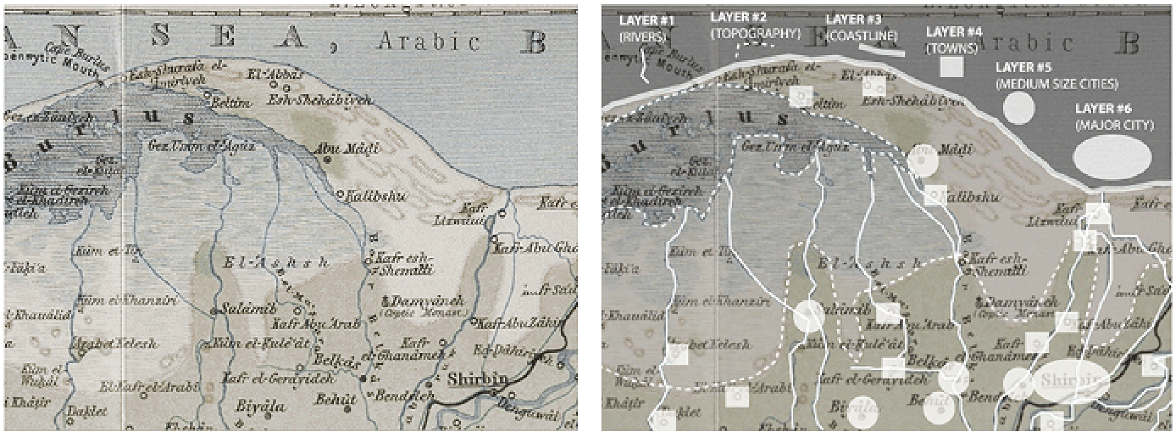
To understand why geographic informations systems is such a natural extension of the TIMEA project and other like-minded humanities projects, one must first view the research of these projects less as a tightly packaged product and more as a composite of vast amounts of information that can be organized in an infinite number of ways. Similarly, GIS is a way of organizing copious amounts of geographic information. It's not a tool, a software, a hardware or even a specific image. It is, quite simply, a concept ,a way of understanding maps. If we were to use one word for describing this concept it would be *layers*.





The TIMEA project aims to create a layered body of research where diverse artifacts are combined to inform the a particular geography, above left. Similarly, at its most fundamental level, GIS is a way of conceiving of maps as *layers* of information. The diagram, above right, shows how a typical town map might be formed from these layers. (image courtesy of *GIS: a short introduction*. Nadine Schuurman. Malden, MA: Blackwell Publishing, 2004)

We can look at an enlarged piece of the same Nile Delta map highlighted earlier as a way of understanding the implications of layering in GIS. The image below left is the original map, and to its right is an annotated version of the same image showing how each element of the map can be understood as a specific feature of the map. Here, since this is just an example, not all elements have been thoroughly categorized but what should be clear is that the map has been subdivided into 6 essential features: rivers, topography, coastline, towns, medium-size cities and major city. Without these features, there is simply no map. Now imagine that each of these feature categories is a seperate layer and when these layers are stacked on top of each other, a geographic image begins to emerge. It seems relatively simple, but this, in a nutshell, is the genius of GIS.

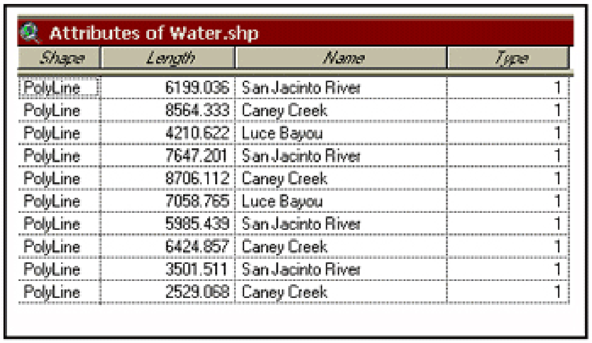


On the left is enlarged piece of the same Nile Delta map from before, and on the right in an annotated version of the same map showing how GIS would categorize the features of the map.

The concept of layering will only seem appropriately novel in context. For centuries, maps were conceived as flat drawings where a map was literally constructed or expanded in a linear fashion through successive travels by an explorer moving horizontally across the landscape. In this process, the cartographer was never really able to see the geography from any perspective other than a personal level or groud-level. From this perspective, each element of a map was simply defined by its most immediately adjacent features; a river, for example, was seen in reference to the towns through which it flowed because this is how it was experienced by the traveler. With the advent of layering in map-making comes a radically new perspective where the map-maker is essentially viewing the geography from above, from a macro level, or analytically rather than simply experientially. Prior to the advent of GIS thinking and its related technologies there was simply no way to achieve this perspective. Now, the same river mentioned above is not only seen in reference to adjacent towns but also as part of an entire regional river system, something that would be very difficult to view from the ground. This river system would then be one layer of the eventual GIS map. To understand how this macro-level view works-- how one might actually see and graph an entire river system-- will require a cursory understanding of the technology behind GIS.

GIS TECHNOLOGY

If the layers that comprise a GIS map must rely on certain information to define features like rivers, towns, roads, railroads, lakes, etc., the next question to ask might then be, how do we capture this information? Earlier periods of cartography have shown that much of the same qualitative and quantitative information we still use to make maps— the proper names of places, their locational coordinates, and distances between places— had been logged systematically on paper through personal experiences and successive travels. With two signature innovations— geo-referenced databases and satellite photography— GIS maps continue to rely on the same cataloguing of geographic information as in earlier periods, but now achieved with far greater precision and efficiency.



Attributes of Water.shp

Shape	Length	Name	Type
PolyLine	6199.036	San Jacinto River	1
PolyLine	8564.333	Caney Creek	1
PolyLine	4210.622	Luce Bayou	1
PolyLine	7647.201	San Jacinto River	1
PolyLine	8706.112	Caney Creek	1
PolyLine	7058.765	Luce Bayou	1
PolyLine	5985.439	San Jacinto River	1
PolyLine	6424.857	Caney Creek	1
PolyLine	3501.511	San Jacinto River	1
PolyLine	2529.068	Caney Creek	1

Behind every GIS map is a series of databases like this one, above left, detailing the critical geographic information for every feature on a map. Here, the database includes a sampling of waterways around Houston, Texas. Scaled satellite photography, above middle, and a handheld GPS receiver (global positioning system) are two satellite-based innovations frequently used to measure distances and capture the locational information for places included in the GIS databases. The photography allows map-makers to study geographies from afar, while the GPS receiver is designed for finer measurements in the field.

The efficiency that this system achieves is of course interrelated with virtually every other digital innovation of our time. Places, when reduced down to a line of spreadsheet data, as seen above, become objects not unlike digital photos and digital audio files that can be reshuffled quickly and easily into a variety of contexts, whether it be an ipod or a powerpoint presentation. But here we're talking about the opportunities afforded by mapping software that allows for geographic data to be represented graphically in a wide array of styles and formats. While it is true that GIS does not specifically refer to computer software, hardware or other technologies, it does *rely* on an ever-expanding set of these tools to produce maps from spreadsheet information like the chart seen above. Within the software, the geographic data functions much like a genetic code for the maps. The map-maker will view the data, use the data, tweak the data but ultimately, the recipient of the map will not necessarily see this data. In the process of making a map, the data is essentially translated into a graphic format within a consistent software interface. Because the geographic data and the software interfaces are "geo-referenced", meaning they are tied to geographic coodinates, the data can be repeatedly brought into software's interface and automically seen in the same location over and over again. Needless to say, implications of making maps where the geographic content can be edited so easily are far-reaching.

Ultimately, the only obstacle to producing new maps as soon as a landscape changes is the the process of gathering the information itself. In some ways, this brings us back to seeing GIS mapping as a concept intimately related with humanities-based research projects like TIMEA. Projects like TIMEA are in fact one of the many ways in which geographic data is gathered for GIS maps, and they serve to underscore the enduring human component of the mapping process. For even if GIS relies significantly on advanced technologies like computer software, satellite imagery and GPS receivers, these devices are still only viable when interpolated by human-beings. TIMEA, like the other contemporary humanties-based projects mentioned above, foregrounds this interpolation process by making an exciting range of human-gathered research available to a diverse general public which can then make its own discoveries. In short, interactive GIS maps are becoming a central component of humanities-based research projects because they not only require human input of information to exist but then facilitate further human interaction through an interface that makes the research both more animated and highly accessible.

The Story of a Manuscript

The Story

Around 200 BC, Quintus Septimus Calamus wrote an epic poem in dactylic hexameters on Romulus, the **Romuleid**. (In fact, Calamus works within a long tradition of oral composition in southern Italy. His is but one version of many still in circulation ca. 200, though it becomes the standard one. Themes in the poem resemble those found in Homer; some modern French theorists would insist that Celtic and Vedic themes are also present. Glib American grad students, I should add, claim to find remnants of the **Romuleid** tradition in Italian pop music.) This is the story of that poem.

Calamus actually writes two versions of the poem, as he corrects various things in it after it was already in circulation. Both versions remain in circulation throughout antiquity; moreover, copyists sometimes combine readings from them.

The poem becomes a favorite of P. Cornelius Scipio Africanus Aemilianus, or the "Younger Scipio," and his circle. Copies circulate among that circle, as well as outside of Rome, including in the Greek East.

Around 110, the grammarian Pedanticus does a critical edition of the poem, incorporating the critical signs developed in the Hellenistic period, in association with the Library of Alexandria. (In the early Augustan period, Pedanticus' great-grandson will write a treatise on unusual words in Calamus.)

In 56, Cicero writes to Lucullus, knowing that Lucullus' father had a very good edition of the **Romuleid** in his vast and excellent library. Cicero asks for a copy, because he has been unable to find a good edition of Calamus' poem among the booksellers at Rome. Cicero had earlier (ca. 67) written to Atticus, asking for a copy of the same poem; perhaps Atticus had failed to deliver, or perhaps Cicero had lost that copy (during his exile?). In 46, Cicero's slave Dionysius steals the copy of the poem Cicero had procured from Lucullus.

In 45, Varro prepares to include a copy of Calamus' poem in the first public library at Rome. The assassination of Caesar halted that project, and Antony made off with Varro's copy. It ends up in the hands of Octavian in 29 BC, after he defeated Antony and Cleopatra in 31 at the Battle of Actium, and after the lovers had committed suicide in Egypt in 30.

In 39, another fine copy of the **Romuleid** fines its way into Asinius Pollio's library, now the first public library in Rome.

In 22 BC, Augustus (having shed the name Octavian in 27), opens his Palatine Library and includes the copy that he had taken from Antony's estate. A copy can also be found in the library at the Porticus Octaviae around that time.

Meanwhile, a good many copies of Calamus' poem circulate among the booksellers in Rome. Most are of very poor quality-filled with mistakes made by weary and marginally educated copyists, as well as their "corrections," which are in fact simplifications.

Copies also circulate in the provinces, of varying quality.

Julius Hyginus, a man of great learning, translates the **Romuleid** into Greek, and he makes some observations on the text of Calamus, stating that he consulted an autographed copy. Marcus Valerius Probus also claims to consult that copy in the first century AD.

In the age of Tiberius (14-37 AD), another copy of the **Romuleid** appears in a new state library, in the Templum Novum. Tiberius also had a copy he kept at Sperlonga for dinner parties, where those in attendance would play trivia games about the poem. Calamus' poem also becomes a school text throughout the west. This means that many cheap editions are made for students; these are riddled with errors.

Life remains good for the **Romuleid** throughout the first century AD and into the second century, despite the vagaries of taste. Copies of the poem appear in private libraries, in public baths, as well as in Trajan's new library (dedicated ca. 112/113). Martial even finds a copy of the poem in codex-form rather than a roll! Calamus then enjoys an even greater vogue in the age of Hadrian and later in the second century, when archaizers read and studied the poem with great enthusiasm. (In Hadrian's circle, a game develops in which one opens the **Romuleid** at random and determine one's fortune from the line upon which the eye lands. History books record the lines.) Aulus Gellius even claims to have seen not one but two copies of the **Romuleid** written in Calamus' hand; at least one was a forgery, however. Gellius also hears of an original edition that a friend of a friend saw in Athens.

In the third century, several abridgements of the poem appear. In the fourth, fifth, and sixth centuries, meanwhile, several grammarians quote lines of the **Romuleid**, as do Church Fathers, particularly Augustine. The poet Ausonius writes about grammarians who cherish their texts of Calamus in Gaul; it is a poignant tableau, since those figures, as teachers, could afford only school editions. (The grammarians have an inkling that something is amiss when they compare their texts and find several variant readings; each thinks his version is the correct one.)

Sometime around 384, a de luxe edition of Calamus' poem appears in codex form, according to Macrobius. This does not survive.

At Vivarium ca. 560, Cassiodorus saw to it that the **Romuleid** was copied and preserved at the monastery. Isidore of Seville, meanwhile, notes that his library contains Calamus' poem ca. 615. Around 700, an Irish monk collects (writes?) scholia on the poem; these find some popularity in the Middle Ages and survive.

Scribes copy and keep the **Romuleid** in many monasteries for the next several hundred years. Most are ultimately lost forever. In fact, it is only through one copy, found in the monastery of Monte Cassino, that the poem survives. This edition is one step removed from the fourth-century de luxe edition. From that archetype, many copies are made, with mistakes inevitably resulting for several reasons: haplography and dittography; substitution of one word for another; a tired or inattentive eye that skips a few lines; the repetition of a line or word; misunderstanding of an abbreviation; and simple misreading of a word. Other changes also occur: Christian bowderlization; glosses; interpolation; "correction"; and the incorporation of marginalia.

Printed editions begin to appear in the Renaissance. Textual critics try to secure what the poet actually wrote-ideally, the goal of all textual criticism. This involves comparing the manuscripts that can be found and assessing their relative quality.

Over time, more and more critics undertake this task, developing stemmata along the way, which for a time have to be changed as more manuscripts are discovered. The abridgements, grammatical treatises, and scholia are also looked at more carefully (and some are rediscovered), with variants between their quoted lines and those in the manuscripts considered. Quotation by ancient sources undergoes the same scrutiny. Finally, the emendations and conjectures by earlier scholars becomes a body of material through which to sift.

In early 2004, an undergraduate at Rice University, having learned some first principles of textual criticism from a somewhat obtuse but well-intentioned professor, decides that someday he/she will produce a critical edition of the **Romuleid**. This work appears in 2020. While he/she cannot know it, the text reproduces exactly what Calamus wrote in his second edition of his poem.

Questions and Discussion

A broad question, but not so broad, I hope, as to be meaningless:

How does textual criticism relate to the issue of authorship and ownership?

Possible talking points:

The quest for the original text, or as near to it as possible.

The two perspectives on authorship and ownership that emendation offers.

Copying without copyright.

The ways that copying can become composing.

5000 to 3000 B.C.

CHAPTER 3-FIFTH & FOURTH MILLENNIA B.C.

Backward to 5000 to 8000 B.C.

5,000 TO 3,000 B.C.

Michael Cheilik (Ref. 28) from City University of New York, calls this period the Chalcolithic (Chalcos = copper, lithos = stone). After draft animals were domesticated and wheeled vehicles were invented transportation over long distances became possible. A stage of intellectual development known as mythopoeic (myth-making) arrived and persisted for centuries. The forces of the universe became appreciated and personal. Sometime in this era came the "Dawn of Civilization" as in a few areas true civilizations appeared. It is probably not unbelievable then, that also at this period the weather and climate was the most ideal of the last 100,000 years, with the possible exception of our own time – the past one-half century. (Ref. 28,224)

As we shall see in the development of this period of history, Egypt and Mesopotamia have long competed in the historians' annals for the honor of being the oldest source of civilization. Very recently carbon-14 dating and bristle-cone dendrology studies in correlation, have suggested that some of the Mediterranean islands (particularly Malta) may have had an advanced culture before such appeared in the fertile Nile Valley. (Ref. 164). Furthermore, recent Danish archaeological excavations on the island of Bahrain in the Arabian Gulf have revealed a civilization antedating that of Mesopotamia' The recent revision of the carbon dating has now even placed some of the stone towers and megaliths of the British Isles back to corresponding early dates. What does this mean? It is difficult to conceive of extensive civilizations developing only on islands. More probable is the thought that these islands were only refuges or way-stations for a seagoing people who had been dislodged by some catastrophe from their original homes, perhaps as yet undiscovered and unidentified. Coast lines have changed, old lands are now covered by seas, and many cities may yet lie buried under sand dunes, lava and ashes or water in many parts of the world. Along the Afro-Asiatic coasts much has changed even since the 5th century B.C. when Hanno sailed down the Atlantic African coast with sixty galleys and 30,000 settlers who established ports which have now become inland fields. The Romans discovered an old city on the Atlantic coast of Africa, already very ancient when they found it, with impressive sun-oriented, megalithic structures. They called this "Maqom Semes", "City of the Sun" or "Lixus, the Eternal City" and felt it to be older than any city inside the Mediterranean. These impressive ruins are now no longer on an island or the coast, but are half-buried on a headland on a ridge surrounded on all sides by flat fields of the Lucus River delta, with the ocean only barely visible in the distance. This is about three miles upstream from the modern city of Larache, Morocco, which is itself about seventy miles down the African coast from the Strait of Gibralter. Engle (Ref. 62) has reported that the ocean shore line in western South America about 6,000 years ago was much to the east of where it is today. Could not this also be true of the western coast of Africa? At any rate, in the ruins "A large Roman mosaic of Neptune bears witness to former links with the ocean, while the ruins of Arab mosques and Roman temples cover earlier Berber and Phoenician structures, refitted in turn from gigantic blocks hauled from far away by the unknown sun-worshippers who first chose this site"[footnote]. On the other hand, dry land has sunk into the Atlantic, making underwater canyons extending out into the ocean floor from African river mouths. Ocean floors have never ceased to move, and some great geological disaster disturbed the Atlantic and split the countryside of Iceland, creating a giant rift canyon that runs across it and beyond in the ocean floor[footnote]. Radio-carbon datings of a tree embedded in lava in this rift indicated that the catastrophe occurred around 3,000 B.C. Does this have some bearing on the shifting of peoples around the Mediterranean at this time and the rather sudden "new" locations of civilizations on the islands and then subsequent locations in Egypt and Mesopotamia?

As quoted in Heyerdahl (Ref. 95), page 356

This north-south valley splits the mid-Atlantic ridge from Iceland to Bouvet Island in the south Atlantic and represents the boundary between crustal, tectonic plates

Sudden changes occurred on Malta and Crete and Cyprus at about 3,000 B.C. with a sudden end to the Neolithic phase and the beginning of a major new era. If a geological occurrence about that time in the Atlantic was great enough to split Iceland, it seems possible that tidal waves would have caused far reaching disasters, forcing population groups to search for new lands, and such events could have been remembered in many peoples legends as the time of the great flood. As Alexander Marshack (Ref. 130) has written, “art, agriculture, science, mathematics, astronomy, the calendar, writing, cities - these things could not have happened "suddenly". The question is how and over how many thousands of years did the preparation require? (Ref. 130, 95, 61, 164)

Forward to 3000 to 1500 B.C.

Choose Different Region

1. Africa
2. America
3. Central and Northern Asia
4. Europe
5. The Far East
6. The Indian Subcontinent
7. The Near East
8. Pacific